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TRUCK UNLOADING OF MANUFACTURER SHIPMENTS AT GROCERY DISTRIBUTION WAREHOUSES

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Truck Unloading of Manufacturer Shipments at Grocery Distribution Warehouses

By John C. Bouma 1/

SUMMARY

Data relating to quantities of grocery products received by various methods were obtained from 129 food warehouse operators that supply corporate chain, cooperative and voluntary group retail food stores, and food service outlets. This study is part of a research project to develop systems that will reduce the cost of distributing grocery products from manufacturer to distribution warehouse.

The 129 firms in this study were classified on the basis of grocery warehouse space occupied, with 61 percent as small, 20 percent as medium, and 19 percent as large. The median 2/ number of accounts serviced by firms in this study was 316 food stores and 265 food service accounts. The warehouses had annual grocery inventory turnover rates that could be considered typical for the industry, namely 13 in small warehouses, 16 in medium-sized warehouses, and 19 in large warehouses. Median overall warehouse labor productivity was 100 cases per man-hour, that is, total cases received plus total cases shipped divided by warehouse man-hours including supervision.

The median warehouse in this study received 60 percent of its groceries by common carrier truck, 30 percent by railroad, and 10 percent by backhaul on their own delivery trucks. Of the respondents 53 percent specified truck delivery dates on warehouse purchase orders and 42 percent used an appointment system for carrier truck receiving. The appointment system for truck arrivals was used by 65 percent of the operators of medium- and large-sized warehouses but only by 27 percent of the operators of small warehouses.

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2/ The median number is the center of the range with half of the respondents above and half below.

Seventy-three percent of the warehouses received merchandise from consolidated warehouses. Also, 92 percent of the respondents indicated receiving products by carrier truck that were unitized by the supplier at the point of loading. All the warehouse operators that reported receiving unitized deliveries received the product on pallets but only 28 percent received unitized products on slip sheets. All respondents received truck deliveries during the day and only 8 percent received carrier truck shipments between 6:00 p.m. and 6:00 a.m.

Of the truck arrivals at the median sized firms 60 percent were full truckloads (FTL) and 40 percent were less than full truckloads (LTL). On the basis of number of cases received, 65 percent were received FTL and 35 percent, LTL.

Productivity in unloading truck receipts is affected by the adequacy of dock and staging areas. Of the respondents, 35 percent indicated that they did not have sufficient space in such areas. From 23 to 58 percent of them indicated excessive waiting periods occurred on different mornings of the week, while only 8 to 10 percent indicated excessive waiting periods on various afternoons. Productivity in unloading is also affected by unitization. Based on timestudies, labor productivity could be 14 times greater in unloading palletized loads compared with handstacked loads. Productivity was also greater with use of electric pallet jacks compared with manual jacks to unload palletized product.

The greatest need was for holding area space for products before placing them in storage in the warehouses where truck receiving was timestudied. In unloading handstacked loads, 12.1 percent of the time was spent in waiting for a place to put the merchandise on the dock. In unloading palletized loads, 34.3 percent of the time was spent in waiting for a place to put the merchandise. An additional delay (2.7 percent of the unloading time in unloading handstacked merchandise and 6.8 percent in unloading palletized merchandise) was encountered in waiting for a pallet jack to pull the merchandise out of the truck onto the dock. The full potential for receiving palletized merchandise was not achieved in the warehouses where timestudies were conducted. Actual productivity in receiving palletized groceries was only 40.1 percent as great as could be possible without avoidable delays, whereas unloading handstacked merchandise was 92.3 percent. This finding indicates that the truck receiving operations were organized to receive handstacked loads in the warehouses studied and were not organized to receive palletized loads at the full potential rate.

With proper scheduling of truck receipts, specifying unitized truck receipts as much as possible, providing sufficient temporary storage area, keeping the temporary storage area clear as much as possible, and providing the proper type and quantity of materials-handling equipment, it is possible to increase productivity in receiving both full and LTL carrier truck shipments. In addition, the median-sized firm in this study indicated only 10 percent of the carrier truck receipts were unitized. Thus, a large potential exists for unitization of shipments with substantial savings available in loading and unloading carrier trucks.

INTRODUCTION

This study was initiated to determine the extent and quantities of grocery products received at distribution warehouses by various methods, with special emphasis on truck unloading of manufacturer shipments. It is part of a broader research project to evaluate various methods for handling grocery products from point of manufacture to receipt at the warehouse. Data were obtained from 129 managers of warehouses operated for corporate retail chain stores, voluntary group wholesalers, and retailer-owned cooperative wholesalers. The warehouses were primarily engaged in supplying retail food stores.

The typical warehouse in this study obtained 70 percent of its grocery products by truck and 30 percent by rail. Furthermore, the typical firm received groceries from 100 trucks per week, 60 of which were full-truck-loads (FTL) and 40 less-than-truck-lot (LTL) quantities.

Statements to the effect that 50 percent of the items on supermarket shelves did not exist 10 years ago may be well founded. The number of items handled by grocery wholesalers has shown rapid growth. For example, a typical grocery wholesaler handled 867 items in 1928, 3,000 in 1946, 4,723 in 1955, and 7,950 in 1973. 3/ In addition to an increase in the number of items handled, the annual grocery warehouse inventory turnover rate 4/ has also increased from 14.2 in 1962 to 17.8 in 1972. 3/ A rule-of-thumb on product movement indicates that 20 percent of the items account for 80 percent of the product movement. Thus, it is logical to assume that with many additional items and increased warehouse turnover, more items will be purchased by distribution warehouses in LTL quantities. Problems associated with LTL receiving would be magnified with the increase in umber of items handled and more rapid inventory turnover.

While this study is concentrated on the warehouse receiving operation, it must be recognized that LTL shipments also influence the shipping operation efficiency by grocery manufacturers as well as transportation efficiency. Most truck shipments of grocery items from manufacturer to warehouse are handled by common carrier. In contrast to full truckload shipments, which are obtained at origin and delivered straight to destination, much additional handling may be involved with LTL shipments. LTL shipments typically are picked up at origin, delivered to a terminal where they are unloaded, combined with other LTL shipments going to the same or approximate destination, and loaded on another truck. Depending on distance and truck lines involved, terminal handling may be involved several times before the item is delivered to the distribution warehouse. Any system that will economically reduce the number of product handlings from manufacturer to wholesaler will reduce the distribution cost.

3/ Progressive Grocery Magazine, vol. 52, No. 4, April, 1973; and vol. 53, No. 4, April, 1974.

4/ Bouma, J. C., and Kriesberg, M., Measures of operating efficiency in wholesale food warehouses. U.S. Dept. Agr. Market. Res. Rpt. 399, p. 27. 1960.

The objective of this study was to determine the quantities of grocery products received by truck, by size of warehouse operation, and to determine factors affecting productivity in receiving truck shipments at the warehouse.

METHODOLOGY

The Department contracted by purchase order with Seminoff, Nixon, Bowman, and Bode to obtain basic information on the quantities of dry groceries received by food distribution warehouses by both FTL and LTL quantities and problems associated with truck shipments. Three national trade associations -- Cooperative Food Distributors of America, National-American Wholesale Grocers' Association, and National Association of Food Chains -- cooperated in the study and mailed questionnaires to their membership to obtain the basic information on warehouse grocery truck receiving operations. Individual companies then returned these questionnaires to the contractor. A total of 909 questionnaires were mailed to association members, the 129 responses amounted to a 14.2 percent return. Basic information relative to the importance of truck receiving operation is based on these responses. Not all respondents answered every question in the survey, hence the number of respondents may not equal 129 in every instance.

In addition to the basic information obtained by mailed questionnaires, timestudies of truck receiving operations were conducted in warehouses by Department of Agriculture personnel. These timestudies were conducted to quantify the efficiency and problems associated with truck receiving in grocery warehouses.

CHARACTERISTICS OF FIRMS SUPPLYING DATA

Certain basic information was obtained from participants to classify firms in the study. Information was obtained relative to size of warehouse, location, number of departments, number and type of customers serviced, overall warehouse labor productivity, dry grocery sales volume, number of dry grocery items handled, and the overall grocery warehouse turnover rate.

Warehouse Size and Location

Respondents were requested to indicate the area in square feet occupied by the dry grocery warehouse. This area excluded other warehousing departments such as produce, meat, frozen foods, manufacturing, enclosed truck and railcar parking, and office space not specifically used for the dry grocery operation. Table 1 shows the number of respondents by size of warehouse and geographic region. Figure 1 illustrates four geographic regions.

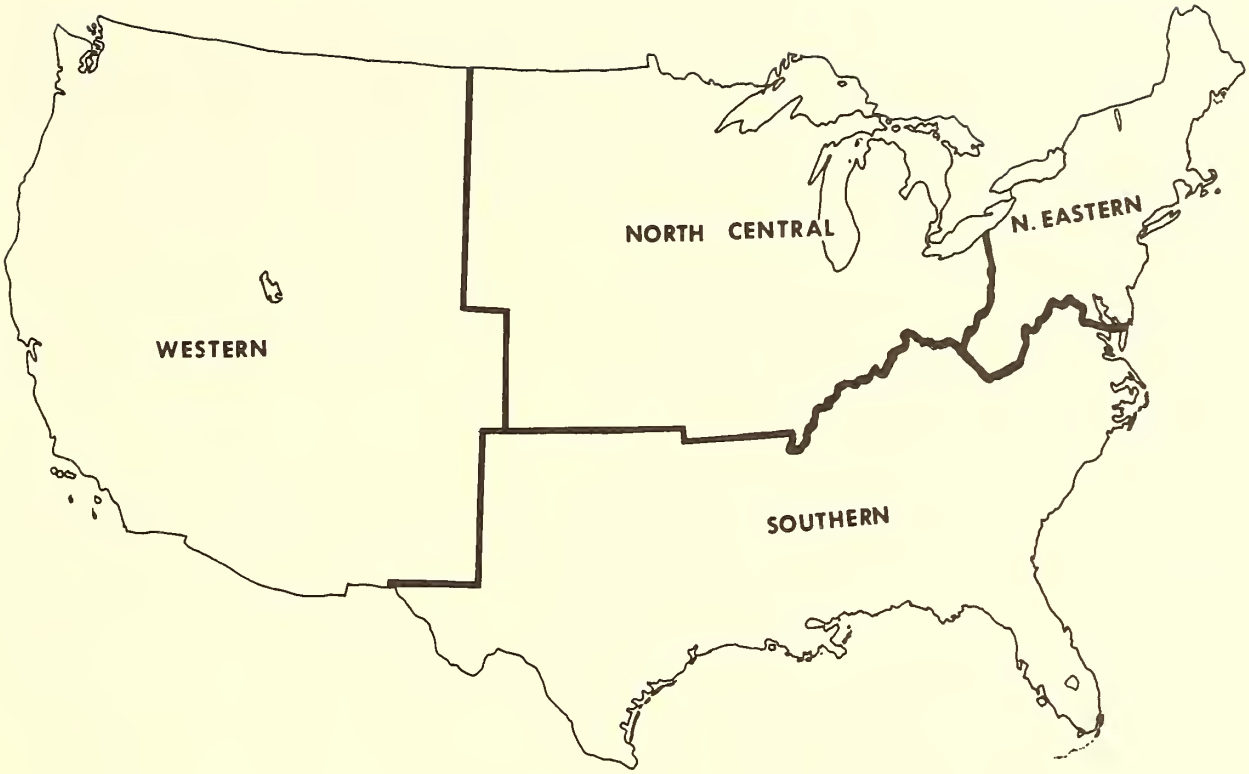

Figure 1.--The four regions included in this study.

Table 1.--Number and percentage of respondents by size of warehouse and geographic region

Region	Small, up to 150,000 sq. ft.		Medium, 150,000 to 250,000 sq. ft.		Large, over 250,000 sq. ft.		Total respondents	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Southern	37	77	5	10	6	13	48	37
North central	20	54	9	24	8	22	37	29
Northeastern	16	57	7	25	5	18	28	22
Western	5	31	5	31	6	38	16	12
Total or average	78	61	26	20	25	19	129	100

Departments in the Distribution Center

A large number of respondents handled other food and related products in addition to groceries at the distribution center. Table 2 shows the percentage of respondents by size of warehouse that handled various products. Typically, an average of four departments were operated in the distribution center by small firms whereas the medium- and large-distribution centers operated an average of five departments.

Table 2.--Departments in the distribution center by warehouse size

Department	Small	Medium	Large	Total warehouses	
	Percent	Percent	Percent	Number	Percent
Grocery	100	100	100	129	100
Frozen food	82	88	64	103	80
Dairy	82	62	60	95	74
Health and beauty aids	55	69	60	76	59
Produce	42	42	68	61	47
General merchandise	40	54	52	58	45
Fresh meat	26	46	44	43	33
Delicatessen	9	31	32	23	18
Bakery	8	12	20	14	11
Manufacturing or packaging	4	12	12	9	7

Type and Number of Customers Serviced

Of the 128 respondents that provided information on the type of customers serviced, 88 indicated they supplied groceries to retail stores only and 2 indicated they supplied only food service outlets. The remaining 38 respondents indicated they primarily serviced retail food stores with the median having 95 percent of the business volume going to food stores and 5 percent going to food service outlets.

The median number of customers serviced by warehouse size is shown in table 3. While the medium and large distributors indicated that they serviced more food service outlets than retail stores, the volume of business going to food service outlets only ranged from 4 to 15 percent.

Number of Grocery Items Handled

Respondents were requested to provide the number of grocery items handled in the warehouse excluding health and beauty aids, cigarettes, and general merchandise. Of the 125 respondents providing the number of items handled, 19 (15 percent) handled from 1,000 to 3,999 items, 87 (70 percent) handled from

4,000 to 6,999 items and 19 (15 percent) handled from 7,000 to 8,999 items. Table 4 shows the range in number of items by warehouse size.

Table 3.--Median number of retail stores and food service outlets serviced by respondents to the survey

Size of warehouse	Number of respondents	Median number of customers serviced	
		Retail stores	Food service
Small	77	249	154
Medium	26	304	660
Large	25	540	615
Total or average	128	316	265

Table 4.--Range in the number of grocery items handled by size of warehouse

Size of warehouse	Number of respondents	Median number of items handled
Small	74	4,500 to 4,999
Medium	26	4,500 to 4,999
Large	25	6,000 to 6,499

Grocery Inventory Turnover

Among the 124 respondents supplying information on their grocery warehouse inventory turnover rate, the median turnover rate was 15, with 50 percent of the wholesalers having a turnover of 13 to 18 turns per year. As warehouse size increases, the turnover rate also increases (table 5). Inventory turnover rate differed little among the regions.

Table 5.--Annual grocery warehouse inventory turnover by warehouse size

Warehouse size	Number of respondents	Median inventory turnover rate	Range in inventory turnover rate
Small	73	13	9 to 17
Medium	26	16	12 to 21
Large	25	19	14 to 28

Grocery Warehouse Labor Productivity

Participants were requested to provide warehouse labor productivity information on the basis of the overall warehouse and for order assembly in cases per man-hour. Computation of cases per man-hour for the overall warehouse was based on the total cases received plus total cases shipped divided by total man-hours with hours including supervision, clerical, maintanance, and repack as well as all "touch" labor. People associated with the delivery operation, such as drivers and dispatchers, were excluded. Among the 94 respondents providing this information, the median had productivity of 100 cases per man-hour with 50 percent of the respondents having productivity ranging from 70 to 126 cases per man-hours. Table 6 shows the overall grocery warehouse labor productivity by warehouse size.

Table 6.--Overall grocery warehouse labor productivity by warehouse size

Warehouse size	Number of respondents	Median productivity cases per man-hour	Middle range productivity cases per man-hour
Small	47	85	63 to 125
Medium	24	112	99 to 129
Large	23	92	82 to 130

Proportion of Receipts by Rail, Common Carrier Truck, and Backhaul

Respondents were requested to supply the percentage of warehouse receipts arriving by rail, common carrier truck, and backhaul. Generally, the backhaul method is used when trucks deliver merchandise to retail stores in the proximity of manufacturer plants or distribution centers and on the return trip to the warehouse, the empty delivery truck is loaded with merchandise.

Some manufacturers have been wary of granting a backhaul allowance, fearing they may be held in violation of the Robinson-Patman Act. To assure manufacturers of Federal Trade Commission approval of backhaul systems, the Commission on December 26, 1973, issued a clarifying statement expressing the view that "--questions probably would not arise under the laws it administers if sellers, using valid, uniform, zone delivered pricing systems, offer to all customers, on a non-discriminatory basis, in lieu of a delivered price, the option of purchasing at a true f.o.b. shipping point price." 5/ With energy problems and basic Federal Trade Commission approval of backhaul systems, the use of backhaul by food distributors will apparently expand beyond that reported in this study. However, some manufacturers are reluctant to offer a backhaul program because of limited dock space or scheduling problems or both, at their warehouses.

5/ Backhaul in Food Distribution. (16 p.) National Commission on Productivity and Work Quality, Washington, D.C. 20508, 22 pp. 1975.

Table 7 shows the median percentage of receipts by the three methods by warehouse size as supplied by 127 warehouse managers. As warehouse size increases the proportion of receipts by backhaul also increases. Because deliveries from large warehouses go over a larger geographic area or to more densely populated areas, the larger firms have more opportunity to backhaul merchandise.

Table 7.--Median percentage of warehouse receipts by 3 methods of delivery and warehouse size

Warehouse size	Method of delivery 1/		
	Rail	Carrier truck	Backhaul
	Percent	Percent	Percent
Small	30	60	10
Medium	30	60	15
Large	30	55	18

1/ The percentages may not total 100 because of rounding.

The proportion of receipts arriving by rail was lowest in the northeastern region (20 percent), when compared with other regions, and was greatest in the southern region (table 8). The proportion of receipts arriving by carrier truck was greatest in the northeastern region and may reflect the quality of rail service in this region.

Table 8.--Median percentage of warehouse receipts by 3 methods of delivery by regions

Region	Method of delivery 1/		
	Rail	Carrier truck	Backhaul
	Percent	Percent	Percent
Southern	34	58	10
North central	30	60	10
Northeastern	20	70	10
Western	30	53	15

1/ The percentages may not total 100 because of rounding.

RECEIVING GROCERIES BY TRUCK

Data were obtained from respondents to determine the number of less-than-truckload (LTL) receipts compared with full truckload (FTL) receipts and methods used for unloading truck receipts.

LTL Grocery Receiving

Of the truck arrivals at the median firm in this study, 40 percent were LTL and 60 percent FTL. The relative number of trucks arriving fully loaded appears to be closely correlated with warehouse size. With small warehouses, the truck arrivals of the median firms were 60 percent LTL, whereas with medium and large warehouses truck arrivals of the median firms were only 25 percent LTL. While LTL shipments account for only 25 percent of the incoming trucks at medium and large warehouses, they still represent a large quantity of product receipts. Large warehouses receiving merchandise from 100 trucks each day would unload approximately 25 trucks having LTL shipments. There was little difference in the extent of LTL and FTL receipts by regions.

Number of Truck Receipts

For the 13-week period before the survey, the median firm received 1,300 truck shipments of grocery items including LTL, FTL, and backhauls. The number of truck receipts was related to warehouse size. For warehouses classified as small, the median number of truck receipts was 525, while firms classified as medium received 2,275, and those classified as large had 4,545 truck receipts containing grocery items. Some large firms received grocery items from more than 500 trucks per week or more than 100 trucks per day.

Quantity of LTL Receipts

LTL receipts accounted for 40 percent of the truck arrivals at the median firm and 35 percent of the cases received. The proportion of LTL receipts varied with warehouse size. Firms classified as having small warehouses received 50 percent of their cases LTL, those classified as having medium warehouses received 25 percent, and those classified as being large warehouses received 20 percent of their cases LTL.

By warehouse size the number of purchase orders specifying LTL quantities were 75, 35, and 26 percent, respectively, for firms classified as having small, medium, and large warehouses. Evidently, more merchandise is ordered in LTL quantities than is delivered LTL. The difference between purchase order specification and actual LTL deliveries was due to consolidation of orders by either the manufacturer or transportation companies.

Of the 129 respondents in the study, 81 (63 percent) indicated they regularly backhaul merchandise in LTL quantities. Approximately the same percentage indicated they backhaul LTL in each warehouse-size group and the same was true by region.

Shipments From Consolidated Warehouses

Apparently, less merchandise is delivered LTL than is ordered in LTL quantities. One reason for this is the number of warehouses that store products for more than one manufacturer and consolidate orders going to a

particular distribution warehouse to ship full common carrier loads. Theoretically, savings are accomplished through use of transportation rates for full common carrier loads as opposed to the rates for less-than-full carrier loads. The consolidated warehouses do not take title to the product in storage and are classified, for transportation-rate purposes, as intransit warehouses. Of the 128 respondents to this question, 93 (or 73 percent) indicated they received merchandise from consolidated warehouses by either rail, truck, or backhaul.

As shown in table 9 the proportion of warehouses receiving consolidated shipments increases with warehouse size. Regional differences in receipts from consolidated warehouses are relatively small, with the largest proportion of those receiving consolidated shipments located in the western region (87 percent), and the smallest percentage in the north central region (68 percent). If overall economies can be achieved with this relatively new concept of consolidated warehousing, the extent of LTL deliveries will be reduced in the future.

Table 9.--Percentage of warehouses receiving shipments from consolidated warehouses by size of warehouse

Warehouse	Number of respondents	Receiving shipments	Not receiving shipments
		Percent	Percent
Small	77	68	32
Medium	26	81	19
Large	25	84	16
Total or weighted average	128	73	27

Seasonality of LTL Receipts

Respondents were requested to indicate whether there is a seasonal factor in the number of LTL shipments received. Of the 126 respondents, 40 percent indicated seasonality is involved in LTL receipts and approximately 40 percent of the warehouse operators in each size group so indicated. Of those indicating seasonality, 6 percent indicated spring was the heaviest season, 37 percent indicated summer, 42 percent indicated fall, and 15 percent indicated winter. Factors contributing to the seasonality of LTL shipments were the seasonal sales of the company receiving shipments, to the crop harvest season, and to manufacturers' seasonal production.

Methods Used to Receive Groceries By Truck

Several factors influence the efficiency of unloading trucks. For the most part these factors are planned before truck arrival at the warehouse. Data obtained from warehouse managers concerning their truck receiving operations were: Hours the dock is open for receipts; scheduling truck receipts; percentage of inbound shipments unitized by the supplier; methods used to unload carrier truck shipments; records of truck detention charges; and receiving records and labor productivity information.

Carrier Truck Receiving Hours

Respondents were requested to indicate their normal receiving hours for carrier trucks. Data were classified as day receiving if the receiving hours were between 6:00 a.m. and 6:00 p.m. and night receiving if hours were between 6:00 p.m. and 6:00 a.m. Among the 128 respondents to this question, 118 (92 percent) indicated that they received merchandise during the day and 10 received both night and day. None received merchandise exclusively at night. As shown in table 10, as size increases the number of warehouses using both day and night receiving also increases. While only 1 percent of the respondents operating small warehouses used both day and night receiving, 28 percent operating large warehouses used both day and night receiving.

Table 10.--Warehouse receiving hours by warehouse size and region

Warehouse size and region	Number of respondents	Receiving hours		
		Day	Night	Both
		Percent	Percent	Percent
Size:				
Small	77	99	-	1
Medium	26	92	-	8
Large	25	72	-	28
Total or weighted average	128	92	-	8
Region:				
Southeastern	48	98	-	2
North central	37	95	-	5
Northeastern	27	89	-	11
Western	16	81	-	19
Total or weighted average	128	92	-	8

Similar differences in receiving hours were noted by regions. Of particular note is the extent to which both day and night receiving are used in the northeastern (11 percent) and the western regions (19 percent). Traffic congestion during the day and warehouse congestion and volume may be factors contributing to the amount of night receiving in these regions.

Scheduling Truck Receipts

The warehouse managers were asked if they schedule truck receipts by specifying the delivery date on the purchase order. Of the 128 responses, 74 (58 percent) indicated they scheduled deliveries and 54 (42 percent), did not. As shown in table 11, as warehouse size increases the proportion of warehouses specifying delivery data on the purchase orders also increases. More warehouses in the north central (75 percent) and the northeastern regions (64 percent) specified the delivery on purchase orders than those in the southern and western regions (45 and 50 percent, respectively).

Respondents were also asked whether they used an appointment system for scheduling carrier truck receiving. With the appointment system the carrier is assured dock space for unloading his truck if the appointment time is met. Of the 128 responses, such a system was used by 54 (42 percent) and not used by 74 (58 percent). Medium and large warehouses used the appointment system more extensively than small warehouses (table 11).

Regional differences in using the appointment system are evident. Only 15 percent of the warehouses in the southern region, whereas 50 percent or more of the warehouses in other regions, used this system. Warehouse managers reported that when the appointment system operates according to schedule the delay of carrier truck in waiting for space at the receiving dock is virtually eliminated, and peaks and valleys in the receiving operation are reduced. This has resulted in less congestion on the dock and reduced overtime in the receiving operation.

Unitization of Truck Shipments by Suppliers

Respondents were requested to provide the percentage of inbound carrier truck receipts that were unitized by the supplier at the point of loading. At the median warehouse, 10 percent of the truck receipts were unitized. Of the 129 respondents, only 9 (7 percent) indicated that they had not received unitized products by carrier truck. The warehouses operated by the nine respondents having never received unitized products were classified as small. As shown in table 12, palletized carrier truck shipment was the predominate method of unitized receiving by the 120 warehouses receiving such shipments.

Of the 120 warehouses receiving unitized truckload shipments, 77 (64 percent) received product with only one form of unitization; 36 (30 percent) received product with two forms of unitization; and 7 (6 percent) received product with three forms of unitization.

Table 11.--Number and percentage of warehouses specifying delivery date and using an appointment system for carrier truck by warehouse size and region

Warehouse size and region	Number of respondents	Specifying delivery date		Appointment system	
		Specify	Do not specify	Use system	Do not use system
		Percent	Percent	Percent	Percent
Size:					
Small	77	45	55	27	73
Medium	26	73	27	65	35
Large	25	84	16	64	36
Total or weighted average	128	58	42	42	58
Region:					
Southern	48	45	55	15	85
North central	36	75	25	50	50
Northeastern	28	64	36	68	32
Western	16	50	50	56	44
Total or weighted average	128	58	42	42	58

Table 12.--Number and percentage of 120 warehouses receiving unitized shipments by various methods

Method of unitization	Number receiving	Percentage receiving
Pallet	104	87
Slip sheet	29	24
Clamp truck	4	3
Cages	2	2
Cargo binders	1	1
Containers	1	1

Of the 100 warehouse managers who indicated a predominate method of receiving unitized shipments, 95 indicated pallets and 5 indicated slip sheets. Seventy-three managers indicated receiving only unitized products or pallets and only 29 managers indicated that they received products on slip sheets. Such information indicates that suppliers may have ample opportunity to unitize carrier truck shipments, especially since the median quantity of unitized shipments represents only 10 percent of carrier truck receipts.

Methods Used to Unload Carrier Truck Shipments

Respondents were asked to indicate methods used to unload carrier truck shipments. Three methods for unloading carrier trucks were given and the respondents could indicate any other (table 13).

Of the 128 respondents, 91 (71 percent) provided carrier truck drivers with pallets and jacks to unload the truck and place the loaded pallet on the dock and 44 (38 percent) warehouses use this method exclusively. Of the 29 respondents that unloaded carrier trucks with warehouse personnel, only two indicated they used this method exclusively. About as many respondents, 88 (69 percent) had the driver stack the merchandise on pallets and the warehouse personnel move the loaded pallet from the truck. This method was used exclusively by 37 warehouses or 29 percent.

Little variation was found in receiving procedures by warehouse size, except the other methods for unloading carrier trucks (see footnote 2, table 13) were used only in firms operating small warehouses. Regional differences in receiving procedures were minor except in the north central area where 89 percent of the firms use warehouse personnel to move palletized product out of the carrier truck and onto the dock, and 39 percent of the firms in the region used this method exclusively.

Table 13.--Number and percentage of warehouses using various methods to unload carrier trucks

Method of unloading	Warehouses using system 1/		Warehouses using system exclusively	
	Number	Percent	Number	Percent
Drivers use warehouse pallets and jacks to unload merchandise onto dock	91	71	44	34
Warehouse personnel use pallets and jacks to unload merchandise onto dock	29	23	2	2
Drivers place merchandise on pallets and warehouse personnel move palletized merchandise onto dock	88	69	37	29
Other methods 2/	5	4	-	-

1/ Totals more than 128 warehouses or 100 percent because of multiple answers.

2/ Includes pull-pack merchandise arriving on slip sheet; driver manually stacks merchandise on pallets on dock; and warehouse personnel assist driver to palletize merchandise.

Carrier Truck Detention Charges

Wholesalers are required to receive carrier truck shipments within specified time limits or pay a detention charge. As shown in table 14, 30 of 49 respondents maintaining records of detention charges indicated paying detention charges. In percentage of carrier truck receipts having detention charges levied, typically less than 1 percent had detention charges levied.

More respondents in the northeastern and north central regions indicated paying detention charges than did respondents in the southern and western regions (table 14).

Table 14.--Percentage of firms paying detention charges, by warehouse size and region

Warehouse size and region	Firms with records of detention charges	Firms having paid detention charges	
	Number	Number	Percent
Size:			
Small	25	13	52
Medium	14	9	64
Large	10	8	80
Total or weighted average	49	30	61
Region:			
Southern	15	6	40
North central	16	10	62
Northeastern	16	13	71
Western	2	1	50
Total or weighted average	49	30	61

Receiving Records and Labor Productivity Information

Warehouse managers were asked if they keep records for each truck unloading that reflect the cases received, carrier, shipper, time arrived, time started, and time completed. The response to the question is shown in table 15. Respondents from large warehouses maintain more complete records on truck receiving than do those of medium and small warehouses.

Regional differences were smaller than differences by warehouse size. While 43 percent of the respondents in the northeastern region kept complete records, only 23 percent did in the southern, 33 percent in the north central, and 38 percent in the western regions.

Respondents were also asked if they maintain receiving records for truck or car unloading time and moving and placing inbound merchandise with a forklift truck. Respondents operating large and medium warehouses maintained more complete records than did those operating small warehouses (table 16).

Table 15.--Information recorded on truck unloading by warehouse size

Warehouse size	Number of respondents	Keep records	Do not keep records	Keep part of records
		Percent	Percent	Percent
Small	78	18	42	40
Medium	26	42	12	46
Large	25	64	4	32
Total or weighted average	129	32	29	39

Table 16.--Records maintained on truck or car unloading time and forklift storage operations by warehouse size

Warehouse size	Number of respondents	Records kept	Records not kept
		Percent	Percent
Small	78	32	68
Medium	26	58	42
Large	25	60	40
Total or weighted average	129	43	57

Warehouse managers were also asked their opinions on how they rate productivity of carrier truck unloading in relation to their own backhaul unloading as higher, lower, or about the same. The majority indicated that unloading productivity was lower on backhauls than on carrier trucks (51 percent), 34 percent indicated productivity was about the same, and 15 percent indicated backhaul productivity was greater. This response is largely based on receiving practices within individual firms. Since carrier truckdrivers palletize the product and move the loaded pallet onto the dock at most firms (table 13) and the warehouse does not pay directly for this service, most managers think labor productivity is lower for unloading backhaul deliveries. In those firms, however, where warehouse personnel palletize carrier truck deliveries and move the product onto the dock, the managers probably rate productivity in unloading backhauls higher because backhauls are usually palletized. Some firms assist in carrier truck unloading by having warehouse personnel remove palletized merchandise and probably rate backhaul unloading

productivity about the same as carrier truck unloading.

INCREASING PRODUCTIVITY IN TRUCK UNLOADING

Timestudies of truck unloading operations were conducted at two large warehouses by Department of Agriculture personnel. These studies were conducted to measure productivity in unloading trucks by various methods and to determine impediments to increased productivity as well as methods to increase productivity. Discussion of findings in these studies follow.

Impediments to Increased Productivity

Many factors affect productivity in unloading operations at the grocery warehouse. Some important factors are (1) availability of parking space at the dock for unloading, (2) unitized or nonunitized loads for ease of handling, (3) availability of temporary storage space on dock for merchandise during unloading, and (4) availability of proper materials-handling equipment for unloading.

Adequacy of Warehouse Dock Space

Respondents in the study were asked whether, in their opinion, they have sufficient dock and staging space to accommodate all truck receipts without excessive waiting periods. Of the 127 respondents, 44 (35 percent) indicated that they did not have sufficient space. The proportion of warehouses with insufficient dock space was approximately the same by all warehouse-size groups; that is, 36, 35, and 32 percent, respectively, for warehouses classified as small, medium, and large. By regions, more firms located in the western and northeastern regions indicated insufficient dock space (44 and 43 percent respectively,) than did firms in the north central and southern regions (27 and 30 percent).

In addition to providing an answer on the adequacy of dock space and staging area, warehouse managers also indicated when excessive waiting periods occur. As shown in figure 2, of the warehouse managers having inadequate dock and staging space, 58 percent indicated excessive waiting periods for unloading on Monday mornings, 46 percent on Tuesday mornings, 39 percent on Wednesday mornings, 23 percent on Thursday mornings, and 39 percent on Friday mornings. Excessive waiting periods were reduced considerably in the afternoon and ranged from 8 to 10 percent on various days of the week. This indicates that common carriers tend to arrive early in the day to have sufficient time to unload their merchandise.

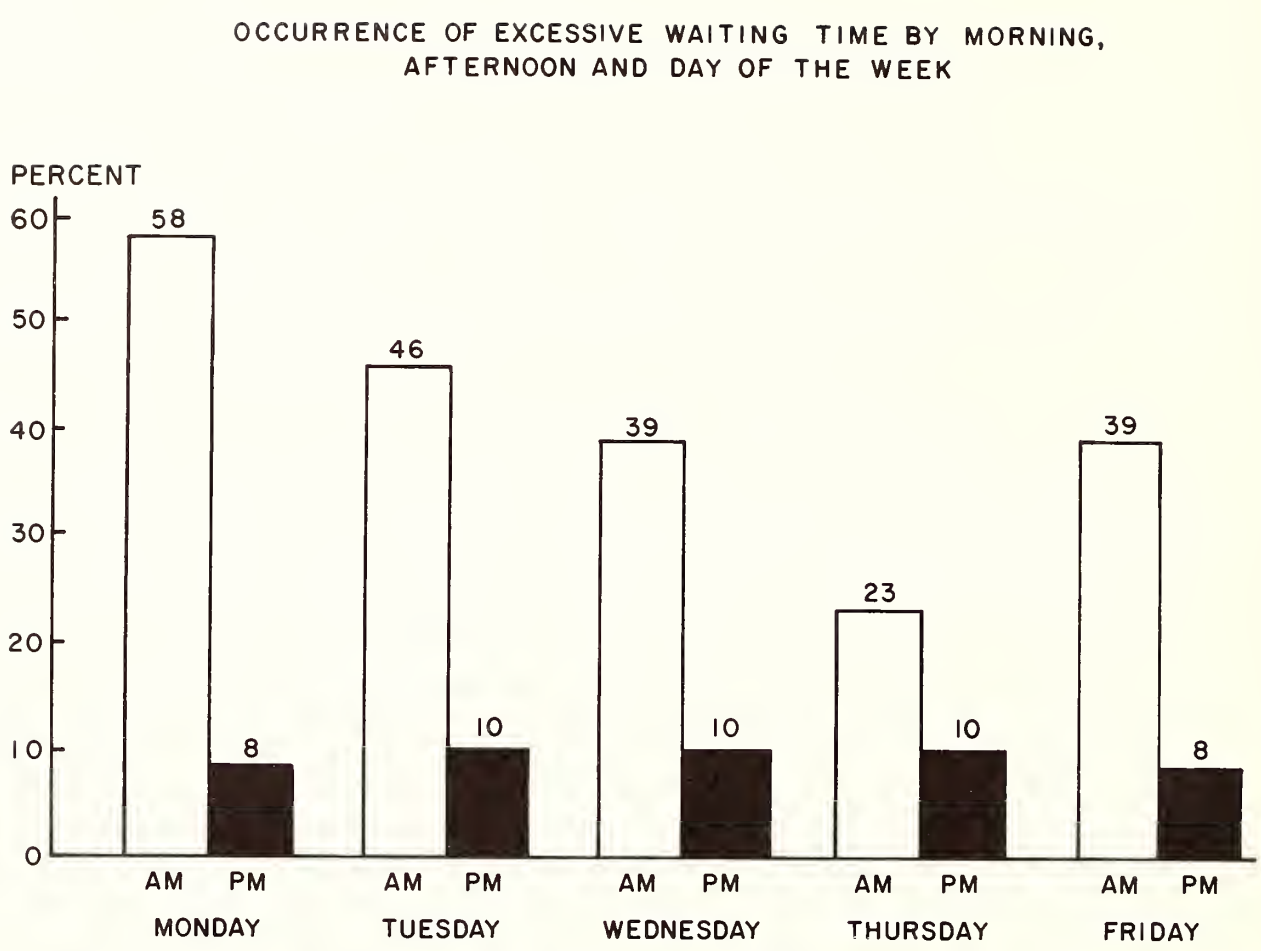

Figure 2

Productivity in Unloading Unitized and Nonunitized Loads

Timestudies of the operations involved in unloading products received in full truckload (FTL) shipments by two large grocery warehouses were conducted to provide a basis for comparing productivity in unloading unitized and nonunitized loads from common carrier trucks. Avoidable delays, such as time spent in conversing or in waiting for pallets or dock space were excluded so that direct comparisons could be made. A 15 percent personal and fatigue allowance was added to the productive time to arrive at a normal or standard time for unloading the product. A brief summary of the productivity levels as determined from the timestudies in unloading nonunitized product is shown in table 17.

Standard productivity in unloading nonunitized products by handstacking cases on pallets and removing the palletized products with an electrically powered pallet jack averaged 199 cases (3.7 tons), per man-hour. In comparison, standard productivity for unloading unitized products was more than 14 times greater (table 18). In all observations, the platform on which the products were unitized was a standard 48- by 40-inch wood pallet. Productivity averaged 2,841 cases (58.1 tons) per man-hour.

Table 17.--Productivity in unloading full truckloads of nonunitized grocery products

Product	Average case weight	Standard productivity per man-hour	
	Pounds	Cases	Tons
Paper bags	64	108	3.4
Crackers	22	224	2.5
Detergent	23	295	3.4
Powdered bleach	29	295	4.2
Soap	40	193	3.8
Cleaner	48	265	6.3
Weighted average	37	199	3.7

Table 18.--Productivity in unloading full truckloads of unitized grocery products

Product	Average case weight	Standard productivity per man-hour	
	Pounds	Cases	Tons
Paper bags	64	842	27.0
Canned pork and beans	47	4,870	115.0
Bagged sugar	60	1,888	56.6
Apple sauce, jars	30	4,880	72.0
Boxed salt	44	2,783	61.2
Bottled soft drink	33	3,505	57.0
Salad dressing	35	4,400	71.5
Weighted average	47	2,841	58.1

The full potential for receiving unitized products was not achieved in the warehouses where timestudies were conducted. Actual productivity in these receipts was only 1,141 cases per man-hour, or 40.1 percent as great as would be possible without avoidable delays; whereas, actual productivity in unloading nonunitized products was 183 cases per man-hour,or 92.3 percent of standard. This result indicates that the truck receiving operations were organized to receive FTL shipments of nonunitized products at near the full potential rate, but not such shipments of unitized products.

Timestudies were also made of the operations involved in unloading products received in LTL shipments in the two warehouses. Basically, productivity in unloading LTL shipments was the same as in unloading FTL shipments, except for the time required for certain basic elements such as placing the dockboard and receiving instructions on pallet patterns. When unloading LTL shipments, such time was spread over a smaller number of cases than when unloading FTL shipments, thereby lowering the productivity somewhat.

Adequacy of Temporary Storage Space

The greatest delay in warehouses where timestudies of truck receiving were conducted was caused by inadequate temporary storage space in which to place palletized products until they could be moved into the warehouse. For unloading nonunitized shipments, 12.1 percent of the time was spent in such waiting and for unloading unitized loads, 34.3 percent. Earlier research indicated that the depth of the temporary storage area on the dock behind the truck should be 40 feet. 6/ The space provided by this depth should be sufficient to prevent productivity in unloading unitized shipments from being entirely dependent upon the forklift storage operation. In the two warehouses in which timestudies were conducted, the temporary storage area was only about 25 feet deep.

In the warehouses studied, occasionally the first drivers to unload had to wait for a place to put palletized merchandise because the temporary storage area was congested with merchandise received the previous day. The temporary storage area could have been cleared by a day-shift forklift operator, with a little overtime, or a nightshift operator could have been assigned to clear the area. An unobstructed temporary storage area on the receiving dock before truck arrivals is essential to efficient operations.

Insufficient and Inadequate Equipment

Another major delay encountered was waiting for a pallet jack to move the palletized merchandise out of the truck and onto the dock. This delay averaged 2.7 percent of the unloading time in receiving nonunitized loads and 6.8 percent in receiving unitized loads. Having sufficient pallet jacks available would prevent such delays.

The type of pallet jack used to unload trucks also influences productivity. In a comparison of the productivity in unloading two trucks of palletized, canned soft drinks with a manual and an electric pallet jack, productivity was 20 percent greater with the electric pallet jack. The standard rate for unloading palletized canned soft drinks with the manual pallet jack was 3,889 cases (46.7 tons) per man-hour and with the electric jack, 4,667 (56.0 tons) per man-hour.

6/ Bouma, J. C., and Lundquist, A. L. Grocery warehouse layout and equipment of maximum productivity. U.S. Dept. Agr. Market. Res. Rpt. No. 342, p. 49. 1959.

One warehouse received a truckload of merchandise unitized on slipsheets that could be moved only by forklift with a push-pull attachment. Because the warehouse did not have this equipment, the driver manually had to repalletize the load for movement by a pallet jack, causing considerable loss in productivity. This loss might have been avoided, if proper communications had been established among the buyer, supplier, carrier, and warehouse operator.

Methods For Improving Truck Receiving Productivity

The efficiency of receiving both FTL and LTL shipments can be improved by use of the following principles: (1) Schedule truck receipts with use of an appointment system to reduce waiting time for parking space at the dock, and--if necessary--extend receiving hours; (2) specify unitized loads on platforms compatible with available materials-handling equipment whenever possible; (3) provide sufficient temporary storage area to reduce waiting time, particularly for unitized loads; (4) keep the temporary storage area clear as much as possible; and (5) provide the proper type and quantity of materials-handling equipment. Products unitized on slipsheets cannot be unloaded as a unit without proper equipment.

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